

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

IRRIGATION FIELD DITCH

(feet)

CODE 388

DEFINITION

A permanent irrigation ditch constructed in or with earth materials, to convey water from the source of supply to a field or fields in a farm distribution system.

PURPOSES

This practice may be applied as part of a resource management system to support one or more of the following:

- ☐ Prevent erosion
- ☐ Prevent loss of water quality
- ☐ Prevent damage to the land due to water logging
- ☐ Make possible proper irrigation water management
- ☐ Efficiently convey water to minimize conveyance losses.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to open channels and elevated ditches of 25 ft³/sec. or less capacity formed in and with earth materials.

It does not include canals and laterals or ditches constructed and removed during a season and ditches shaped or constructed for lining installations or irrigation canals or laterals that deliver water to a farm or group of farms.

Field ditches shall serve an integral part of an irrigation water distribution system designed to facilitate the conservation use of soil and water resources.

Water supplies and irrigation deliveries for the area served shall be sufficient to make irrigation practical for the crops to be grown and the irrigation water application methods to be used.

Field ditches shall be constructed in earth material that contains enough fines to prevent excessive seepage losses and where shrinkage cracks will not endanger the ditch, or cause downslope water quality problems. The sealing effect of sediment carried in the irrigation water may be considered.

CRITERIA

General criteria applicable to all purposes

Capacity requirements

Field ditches shall have adequate capacity to deliver:

1. The design peak consumptive use of the crop(s) to be grown in the field, with proper provisions for the expected field irrigation efficiency.
2. The largest irrigation stream required for the irrigation method(s) planned for the field.

The design capacity shall include additional flow required to compensate for the ditch seepage loss and to safely carry surface runoff from adjacent lands that must be transported to waste ways or overflow points.

For capacity design, the value of Manning's "n" shall be selected according to the materials in which the ditch is constructed, the alignment and hydraulic radius, and additional retardance because of weeds or moss.

Velocities

Field ditches shall be designed to develop velocities that are non-erosive for the soil materials through which they pass.

Local information on velocity limits, as approved by the NRCS State Conservation Engineer shall be used if available. If such information is not available, the maximum design velocity shall not exceed those shown in Table 1.

Field ditches shall be designed with enough capacity to carry the required flows at the velocities that will be developed under the maximum probable retardance conditions.

For checking designs to see that velocities do not exceed permissible values, a Manning's "n" no greater than 0.025 shall be used.

Stability

Characteristics of a stable ditch are:

1. The ditch neither aggrades nor degrades beyond tolerable limits.
2. The ditch banks do not erode to the extent that the ditch cross section is changed appreciably.

Stability checks that are flow related are not required if velocity is 2 ft/s or less.

For newly constructed ditches in fine-grained soils and sands, Manning's "n" values shall be determined according to procedures in Chapter 6 of TR-25, and shall not exceed 0.025.

Cross section

Freeboard in field ditches shall be not less than one-third of the maximum design depth of water. Side slopes shall be stable. The top width of banks as measured at the elevation providing the required freeboard shall be not less than 12 inches and shall equal or exceed the flow depth.

If a field ditch is to be constructed on an embankment, side slopes of the embankment shall not be steeper than the values shown in Table 1.

Table 1

| Height to Water Surface on Centerline of Fill | Embankment Side-Slope |
|---|-----------------------|
| < 3 ft | 1-1/2:1 |
| 3 - 6 ft | 2:1 |
| > 6 ft | 2-1/2:1 |

Water surface elevations

All field ditches shall be designed so that the water surface elevations at field takeout points are high enough to provide the required flow onto the field surface. If ditch checks or other control structures are to be used to provide the necessary head, the backwater effect must be considered in computing freeboard requirements.

The required water surface elevation above the field surface will vary with the type of takeout structure or device used and the amount of water to be delivered through each. A minimum head of 4 inches shall be provided, except when using siphon tubes, where a minimum of 6 inches shall be provided.

Related structures

Erosion, water control structures, culverts, diversions, or other related structures needed to supplement the field ditch shall be designed and installed to meet NRCS standards for the particular structure and type of construction.

CONSIDERATIONS

Water Quantity

1. Effects on the water budget, especially on volumes and rates of runoff, infiltration, evaporation, transpiration, and deep percolation.
2. Potential for a change in plant growth and transpiration because of changes in the volume or level of soil water.
3. Effects on downstream flows or aquifers that would affect other water uses or users.

4. Effect on the water table of the field in providing suitable rooting depth for anticipated land uses.

Water Quality

1. Effects on erosion and the movement of sediment, and the soluble and sediment attached substances carried by runoff.
2. Effects on the movement of dissolved substances to ground water.
3. Short-term and construction related effects on the quality of downstream watercourses.
4. Potential for uncovering or redistributing toxic material.
5. Effects on wetlands or water-related wildlife habitats.
6. Effects on the visual quality of water resources.
7. Effects of water level control on salinity of soils, soil water or downstream water.

PLANS AND SPECIFICATIONS

Plans and specifications for constructing irrigation field ditches shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purposes.

OPERATION AND MAINTENANCE

An Operation and Maintenance plan must be prepared for use by the landowner or operator responsible for irrigation field ditches operation and maintenance. The plan should provide specific instructions for operating and maintaining the irrigation field ditches to insure it functions properly. Minimum requirements to be addressed in the Operation and Maintenance Plan are:

1. Prompt repair or replacement of damaged components is necessary
2. Remove debris and foreign material from field ditches and other components that hinders system operation
3. Maintain good vegetative cover on all slopes and watercourses.

REFERENCES

- USDA NRCS, National Engineering Field Handbook for Conservation Practices.
- USDA NRCS, Washington Irrigation Guide.
- USDA NRCS, National Engineering Handbook - Irrigation Guide.
- USDA NRCS, Standard Drawings Handbook - Washington.
- USDA NRCS, National Engineering Technical Release, Design of Open Channels, TR-25, October 1977.